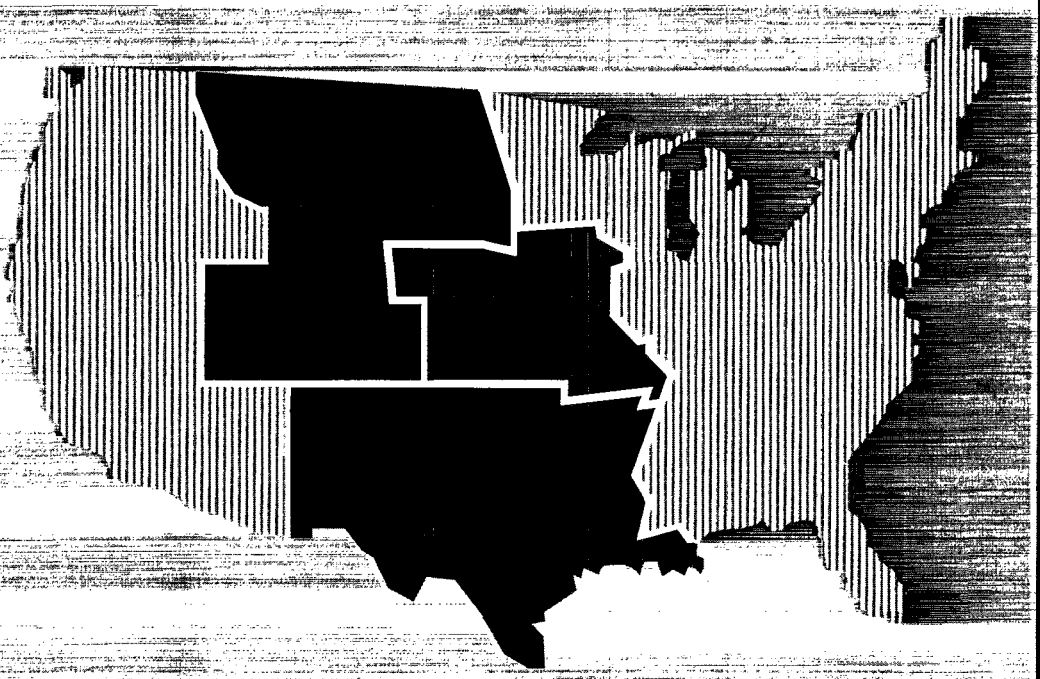
ARCS

Remedial Activities at Uncontrolled Hazardous Waste Sites in the Zone of Regions VI, VII, VIII

Contract No. 68-W8-0112

United States
Environmental Protection Agency



CH2M HILL

Quality Assurance Project Plan
RSR Corporation Superfund Site
Operable Unit No. 2

ARCS Contract No. 68-W8-0112
EPA Work Assignment No. 68-6P2H
CH2M HILL Master Project No. TXE68117

September 1994

Review and Approval:

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Prepared for

U.S. Environmental Protection Agency

Prepared by

CH2M HILL

September 1994

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Introduction

U.S. Environmental Protection Agency (EPA) policy requires all Alternative Remedial Contracts Strategy (ARCS) activities be controlled by a centrally managed quality assurance (QA) program. This requirement applies to all environmental monitoring and measurement efforts mandated or supported by EPA, including those associated with remedial investigations/feasibility studies (RI/FSs) and Remedial Action (RA). Each contractor that generates data is responsible for implementing minimum procedures to ensure that the precision, accuracy, completeness, and comparability of its data are known and documented. This Quality Assurance Project Plan (QAPP) for the RSR Corporation Superfund site, Operable Unit No. 2 (OU No. 2) in EPA Region VI has been developed in conformance with the EPA's mandate.

This QAPP is one component of the Sampling and Analysis Plan (SAP), which supports the RI. The Field Sampling Plan (FSP) is the other component of the SAP which covers all data collection activities planned for OU No. 2. Project activities covered under this QAPP support the RI/FS.

This document provides the rationale and QA requirements for project activities based on data quality objectives (DQOs). EPA guidance concerning developing DQOs was issued in March of 1987 (EPA, OSWER Directive 9355.0-7B). DQOs for the specific field activities for the site are included in the FSP, which supplements the QAPP. This QAPP, to the extent possible, includes region-specific requirements for several elements basic to QAPPs.

DHA Oversight Plan for OU No. 2 EPA Work Assignment No. 68-6P2H and the FSP should be referenced for a complete description of the activities to be conducted as part

of the project. Activities in OU No. 2 include remediation verification sampling. The activities and analyses that will be requested are described in Sections 1 and 2 of the FSP.

List of Abbreviations

AA	Atomic Absorption
ARARs	Applicable or Relevant and Appropriate Requirements
ARCS	Alternative Remedial Contracts Strategy
COC	Chain-of-Custody
CR	Community Relations
DHA	Dallas Housing Authority
DRA	Demolition and Removal Action
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
HSP	Health and Safety Plan
ICP	Inductively Coupled Plasma (spectroscopy)
FSP	Field Sampling Plan
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PM	(ARCS Contractor) Program Manager
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RPD	Relative Percent Difference
RPM	(EPA) Remedial Project Manager
RSD	Relative Standard Deviation
RTL	Review Team Leader
SACM	Superfund Accelerated Cleanup Model
SM	(ARCS Contractor) Site Manager
SOP	Standard Operating Procedure
SOW	Statement of Work
TAL	Target Analyte List
TCLP	Toxicity Characteristics Leaching Procedure
TL	Task Leader
TWC	Texas Water Commission, now the Texas Natural Resource Conservation Commission (TNRCC)

Section 1.0

Project Description

This Quality Assurance Project Plan (QAPP) was prepared for the United States Environmental Protection Agency (EPA), Region VI, in response to Work Assignment No. 68-6P2H under Contract No. 68-W8-0112 for Operable Unit (OU) No. 2 of the RSR Corporation Superfund Site.

The QAPP for this investigation describes the policy, organization, functional activities, and quality assurance and quality control protocols necessary to achieve data quality objectives (DQOs) dictated by the intended use of the data. The FSP provides guidance for all field work by defining in detail the sampling and data-gathering methods to be used on the project. These two documents together comprise the SAP that covers field activities for OU No. 2. An accompanying document is the Health and Safety Plan (HSP), which defines the detailed health and safety practices that are to be implemented during the field activities, in compliance with corporate, EPA, and OSHA requirements.

1.1 Site Description and History

Operable Unit No. 1 of the RSR Corporation Superfund Site is located to the west of downtown Dallas, Texas. OU No. 2 is inside the area bounded on the north by the Canada Drive, on the west by Westmoreland Road, on the south by Singleton Boulevard, and on the east by Kingbridge Street. OU No. 2 consists primarily of single- and multi-family public housing developments completed in 1958, which are presently under the jurisdiction of the DHA.

From 1936 until 1971, a lead smelting facility located at 2820 North Westmoreland Road, south and southwest of the DHA property, was operated by Murph Metals, Inc. and its predecessors. In 1971, RSR Corporation acquired the lead smelting operation and established Murph Metals as an operating subsidiary. The facility continued to operate under RSR Corporation until March 1984 by the current owner, Murmur Corporation. The Murmur Corporation facility consists of the smelter building and other associated properties, including a battery-wrecking facility and a manufacturing and fabricating facility producing lead shot and foil.

As a result of a lawsuit brought by the City of Dallas and the Texas Air Control Board against RSR Corporation in 1983, the company was required to take corrective measures at the facility, which included installation of stack emission controls. RSR Corporation was also required to fund a cleanup of the residential community within 1/2 mile of the smelter. The cleanup, conducted in 1984 through 1985, required the removal of soils in the residential areas where analytical results indicated lead concentrations greater than 1,000 ppm, which was considered a safe and appropriate level at that time. The soils were removed to a depth of 6 inches, replaced with clean fill, and covered by sod. Soils from public play areas, day care centers, and residential gardens were removed to a depth of 12 inches and replaced with washed sand or clean soil.

Also in 1983, the City of Dallas declined to renew the operating permit for the smelter. This decision was based on the facility's historical practices and City zoning ordinance restrictions. As a result, the smelter facility closed in 1984.

Concerns about lead contamination in the West Dallas area re-emerged in 1991 when the Texas Water Commission (TWC), now the Texas Natural Resources Conservation Commission (TNRCC), began receiving complaints from area residents about slag piles and battery chips allegedly originating from the former RSR Corporation facility. Results of sampling conducted in 1991 indicated that there were many contaminated properties in

the vicinity of the facility. Subsequently, TNRCC and EPA agreed to conduct activities necessary to identify contaminated properties, and remediate, if necessary.

Soil sampling conducted by EPA in 1991 verified the presence of soil lead contamination greater than 500 ppm in residential areas surrounding the smelter facility and the use of battery chips and slag as fill materials. As a result, EPA initiated a removal action in the residential area adjacent to the smelter. Cleanup levels for this removal action are 500 ppm lead, 20 ppm arsenic, and 30 ppm cadmium. In addition, the TWC initiated a door-to-door residential survey and sampling investigation in 1992 to ascertain the location of areas where battery chips and slag were used as fill and to determine soil contamination levels in those areas. The TWC investigation and report have been completed. The EPA removal action is also complete.

On May 10, 1993, EPA announced the proposal of the RSR Corporation Site to the National Priorities List (NPL) of Superfund sites. The site received a score of 50.0 based on the soil exposure pathway. Fallout from historical air emissions had resulted in contamination of properties near the site. In addition, the use of battery chips and slag as residential fill materials is believed to be a significant route of exposure to the residential populations in the area.

The RSR Corporation Superfund Site is currently divided into five OUs, as follows:

- OU No. 1 - Residential Property
- OU No. 2 - Dallas Housing Authority (DHA) Property
- OU No. 3 - Slag Piles
- OU No. 4 - Murmur/RSR Smelter - Tract I
- OU No. 5 - Murmur/RSR Smelter - Industrial Property

The boundaries of these operable units are presented in Figure 1-1. This QAPP covers activities associated with OU No. 2, which is shown in Figure 1-2.

1.2 Project Schedule

The project schedule assumes that activities conducted during the Demolition and Removal Action (DRA) will require approximately 8 months to complete. (This schedule is included as Figure 1-3, which is Exhibit 5-1 from CDM's Demolition and Removal Action Workplan.)

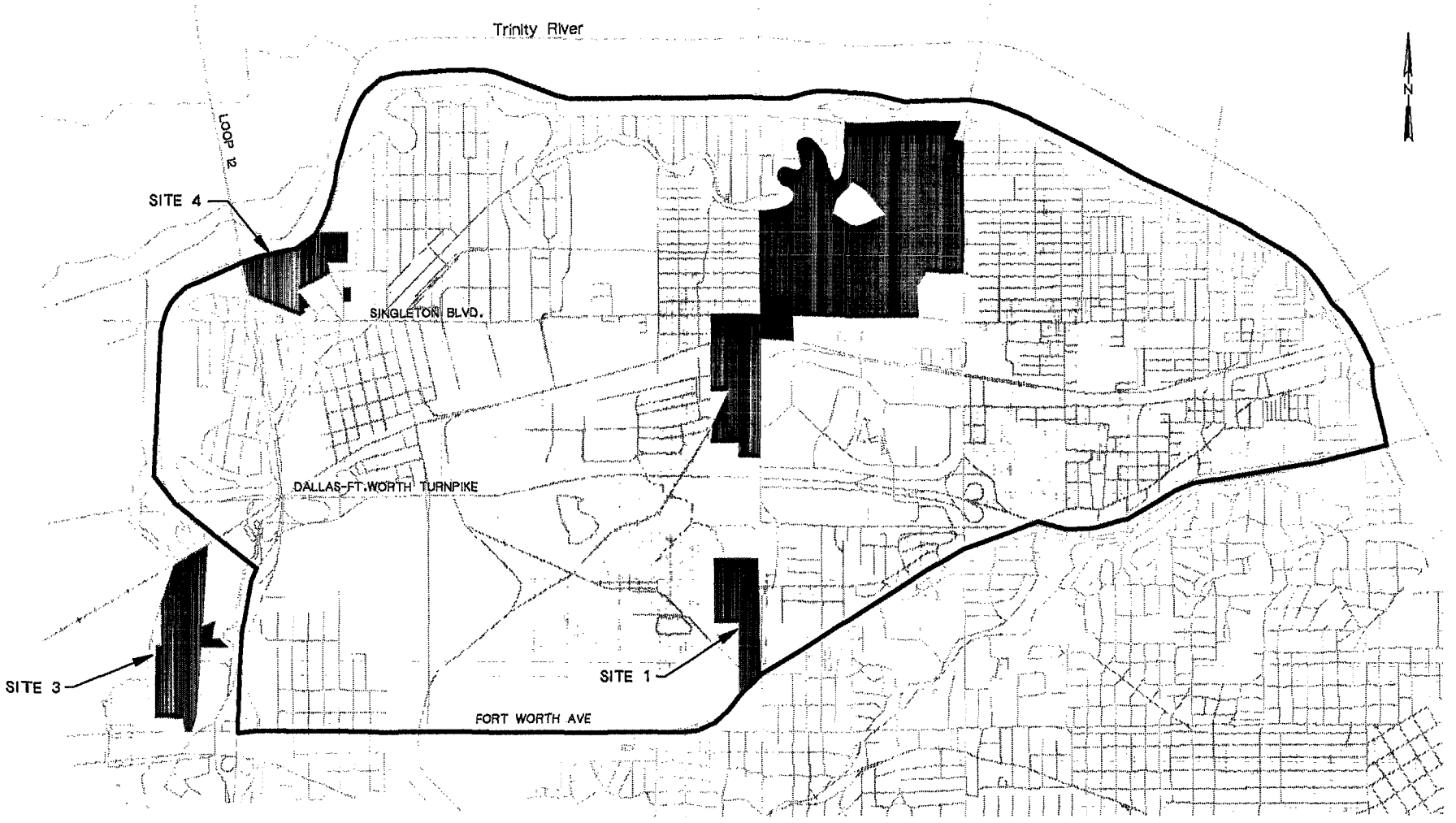
1.3 Data Needs

The OU No. 2 verification data must be sufficient to aid in the evaluation of potential significant exposures to contaminants and the remedial responses required to mitigate those exposures. Specifically, data must be collected to evaluate the following:

- Potential site problems associated with contaminated media at each area sampled, media interaction, potential pathways for contaminant migration, and potential receptors (human and environmental).

- Applicable or relevant and appropriate requirements (ARARs) which include standards, criteria, limitations and requirements of federal or state laws used to assess substance, location, and action-specific requirements for potential response actions.

Data gathered or available from previous work at other OUs that are determined to be applicable to OU No. 2 will be used in site evaluations and development of RAs.



RESIDENTIAL PROPERTY (OU NO. 1) BOUNDARY

DALLAS HOUSING AUTHORITY (DHA) PROPERTY (OU NO. 2)

SLAG PILES (OU NO. 3), SITES 1, 3 AND 4

MURMUR/RSR SMELTER-TRACT 1 (OU NO. 4)

OTHER MURMER/RSR INDUSTRIAL PROPERTY (OU NO. 5)

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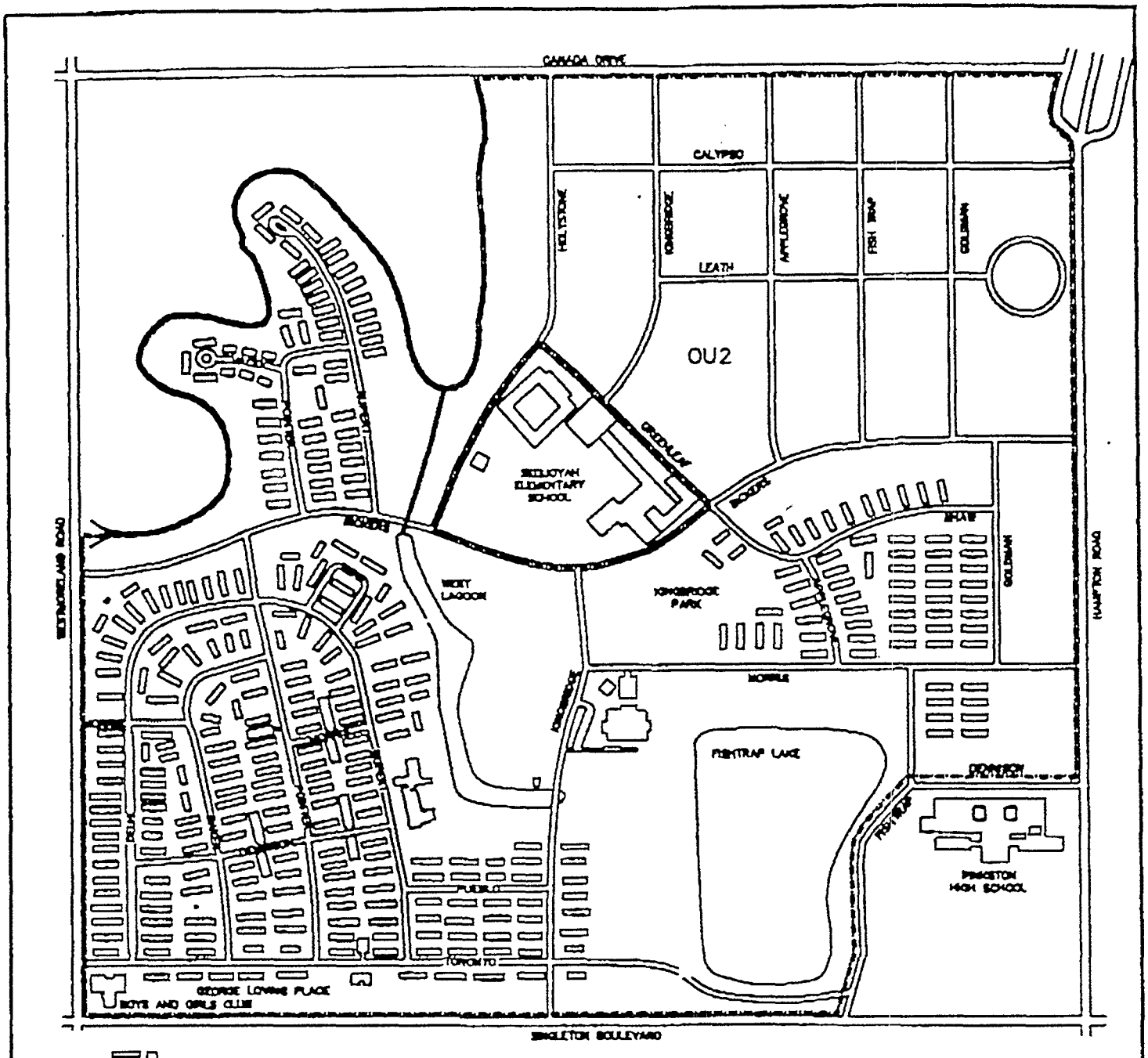
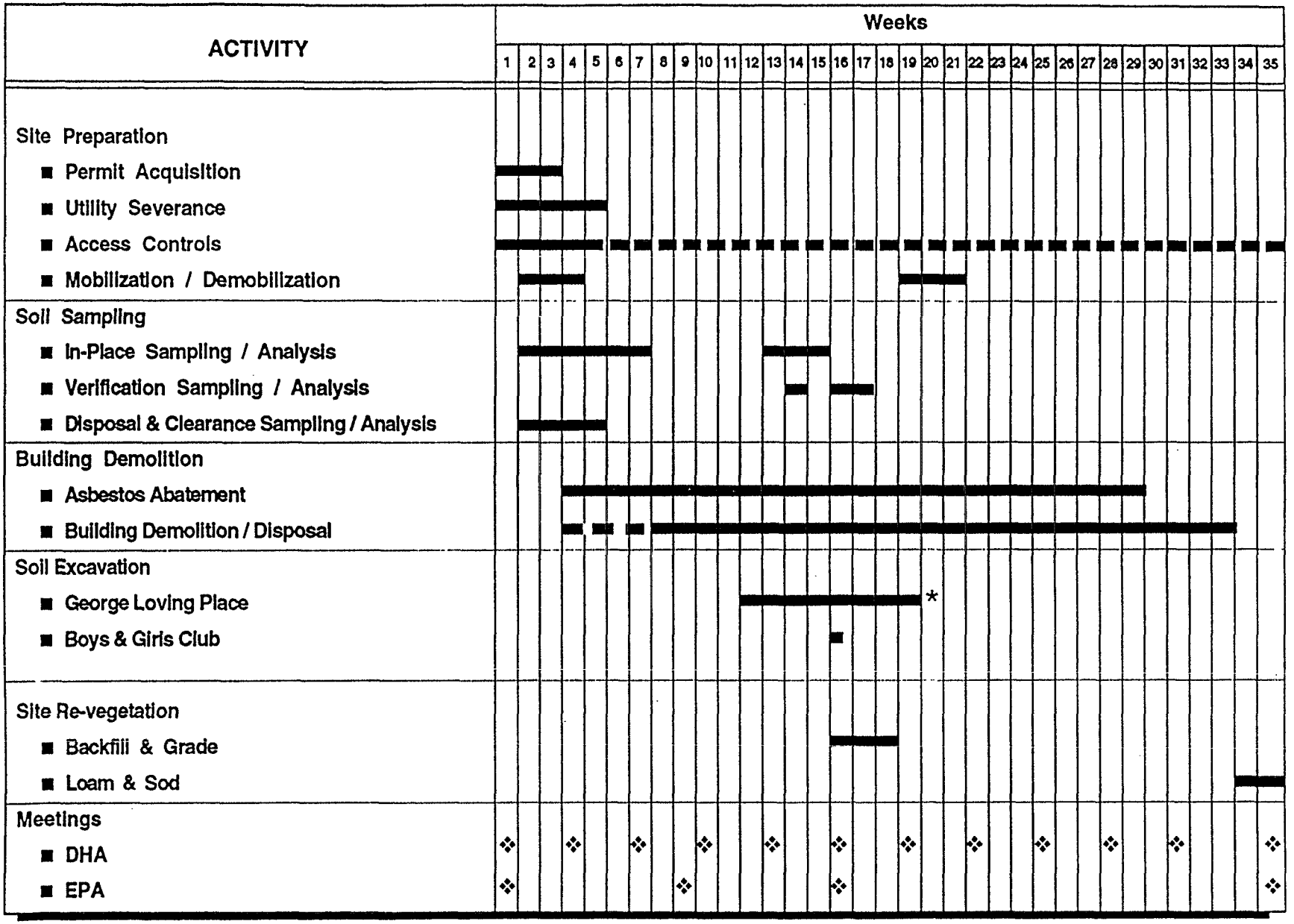
FIGURE 1-1
VICINITY MAP
RSR CORPORATION SUPERFUND SITE
DALLAS, TEXAS



BASE MAP
DALLAS HOUSING AUTHORITY
DALLAS, TEXAS

JONES AND NEUSE, INC.
Environmental and Engineering Services

Figure 1-2



* *Additional soil excavation based on verification sampling / analysis.*

Exhibit 5-1
Removal Action Schedule
Dallas Housing Authority

Figure 1-3

Section 2.0

Project Organization and Responsibility

The proposed project organization incorporates a Site Manager (SM) who is supported by a senior review team serving under the ARCS Program Manager.

The Program Manager (PM) is responsible for allocating the staff and other resources needed to successfully and responsively complete the work assignment. The PM also ensures that each of the project elements receive the appropriate quality control (QC) reviews. Supported by the ARCS Contracts Specialist, the PM is also responsible for contract administration, subcontracting, and reviewing administrative deliverables.

Similar to all ARCS assignments, the RSR OU No. 2 project team will be supported by a Review Team Leader (RTL). The RTL and the team will be responsible for reviewing each of the project deliverables before they are submitted to EPA. They also will serve as a technical resource to the SM for the duration of the project on an as-needed basis.

The SM will be responsible for managing the execution of project tasks by effectively coordinating the resources of the project team. The SM will be responsible for all technical, financial, and administrative elements and will be the central focus for the coordination with the EPA Regional Project Manager (RPM).

The SM is supported by Task Leaders (TLs) for the major components of the work assignments. The TLs are working members of the resource team who will provide the central focus for their respective specialties.

Section 3.0

Quality Assurance for Analytical Data and Field Measurements

DQOs will be established for each major sample collection effort. DQOs are the quantitative and qualitative descriptions of the quality of data required to support an environmental decision or action. They are target values for data quality and are not necessarily criteria for acceptance or rejection of data. Ideally, the data user is responsible for developing DQOs for a specific purpose. Everyone from the data gatherer to the laboratory technician to the decision maker is involved in the process from the beginning. The DQO development process involves three stages: (1) defining the question or decision to be made, (2) clarifying and precisely identifying the information required, and (3) designing the data collection program. The traditional indicators of data quality are discussed as part of the processes and include the following:

- Precision—A quantitative measure of the variability of a group of measurements compared to their average value. Precision measures the reproducibility of measurements under a given set of conditions and will be stated in terms of percent relative standard deviation (percent RSD).

- Accuracy—The degree of agreement of a measured value with the true or expected value of the quantity of concern. Accuracy will be expressed as percent bias.

- Representativeness—Assurance that presented data are statistically sound and accurately show the physical or chemical state of the parameters tested/measured at a given time and place. Representativeness criteria will be established on an activity-specific basis.

- Completeness—A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected under normal conditions. Completeness ranges will be established on an activity-specific basis from criticality, existing historical data, and identified project goals.

- Comparability—A qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability can be measured and assessed by using standard, published sampling and analytical data.

3.1 Sample Media, Analytical Parameters, Analytical Methods, and Level of Quality Assurance/Quality Control

Onsite media to be sampled as part of the OU No. 2 DRA field activities include: building debris disposal verification and soil excavation verification.

Table 3-1 summarizes the analytical parameters and analytical methods for all media to be sampled.

Appropriate QA field samples and QA laboratory samples will be analyzed to evaluate the precision and accuracy criteria. The precision of the field sampling efforts and the laboratory results will be evaluated by examining the results of the field duplicates and laboratory replicates. Analytical precision will be evaluated using the results from laboratory matrix spike/matrix spike duplicate (MS/MSD) samples and laboratory replicate samples, in addition to required laboratory QC samples. The accuracy of the analytical data will be assessed by examining the results obtained from analyzing sample blanks, laboratory MS/MSD samples and required laboratory QC samples. The use of

QC sample results in determining precision and accuracy is described in detail in Subsection 3.3 of this document.

Representativeness will be attained by following the appropriate sampling methods, sample custody, sample preservation, documentation, and other procedures outlined in the FSP.

Comparability will be obtained by sampling each medium in a consistent manner. A qualitative assessment of the actual completeness achieved will be made; the purpose of the assessment will be to demonstrate that (1) a sufficient number of meaningful measurements were made to address the important issues at the site, and (2) necessary conclusions may be reached. A completeness goal of 90 percent useable data points is targeted for the study. This number accounts for normal sampling and analysis conditions.

Acceptance ranges for laboratory accuracy and precision have been established by EPA through extensive inter-laboratory method validation studies. Where EPA-established precision and accuracy goals are not available, the laboratory will establish the goals consistent with the specified methods.

In striving to meet the QA objectives outlined above, the Contractor will submit the samples and implement the data reduction and reporting procedures described in Section 8. Details of the calculations for assessing the accuracy, precision, and completeness of the data are presented in Subsection 3.3.

Table 3-1
Analytical Methods, Detection Limits, and Data Quality Objectives
RSR Corporation Superfund Site OU No. 2

Parameter/ Matrix	Analytical Method	Detection Limit (ppb)	Accuracy (%)	Precision (RPD)[a,b]	
				Water	Solid
Total Lead, solid[d]	SW846/7000/6010	8,000	75 to 125	35	
pH (tap water)	150.1	0.1 unit	0.1 unit	--	
TAL Metals[c]					
Aluminum	SW846/6010	9,000	75 to 125	20	35
Antimony	SW846/6010	6,400	75 to 125	20	35
Arsenic	SW846/7060	2,000	75 to 125	20	35
Barium	SW846/6010	400	75 to 125	20	35
Beryllium	SW846/6010	60	75 to 125	20	35
Cadmium	SW846/6010	800	75 to 125	20	35
Calcium	SW846/6010	2,000	75 to 125	20	35
Chromium	SW846/6010	1,400	75 to 125	20	35
Cobalt	SW846/6010	1,400	75 to 125	20	35
Copper	SW846/6010	1,200	75 to 125	20	35
Iron	SW846/6010	1,400	75 to 125	20	35
Lead	SW846/6010	8,400	75 to 125	20	35
Magnesium	SW846/6010	400	75 to 125	20	35
Manganese	SW846/6010	6,000	75 to 125	20	35
Mercury	SW846/7470	40	75 to 125	20	35
Nickel	SW846/6010	3,000	75 to 125	20	35
Potassium	SW846/6010	dependent on operating conditions			
Selemium	SW846/7740	1,000	75 to 125	20	35

Table 3-1
Analytical Methods, Detection Limits, and Data Quality Objectives
RSR Corporation Superfund Site OU No. 2

Parameter/ Matrix	Analytical Method	Detection Limit (ppb)	Accuracy (%)	Precision (RPD)[a,b]	
				Water	Solid
Silver	SW846/6010	1,400	75 to 125	20	35
Sodium	SW846/6010	5,800	75 to 125	20	35
Thallium	SW846/6010	8,000	75 to 125	20	35
Vanadium	SW846/6010	1,600	75 to 125	20	35
Zinc	SW846/6010	400	75 to 125	20	35

[a] RPD = relative percent difference
[b] Precision and accuracy are given for only those parameters having established ranges
[c] The data quality objectives apply only to standard aqueous matrices.
[d] The data quality objectives apply only to standard solid matrices, such as soil. For other solid matrices, the data quality objectives should be considered as advisory only.
[e] Total Metals will be analyzed for 10% of soil and water samples.

3.2 Procedures for Quality Assurance/Quality Control Assessment of the Chemical Data

This subsection summarizes QA/QC procedures for assessing the quality of chemical data generated and the format for presenting the results of QA/QC evaluations for the RI/FS.

Data evaluation procedures will be used to evaluate results of laboratory system checks and QA/QC samples that are submitted to the analytical laboratory from the field or are generated internally by the laboratory according to this QAPP. The purpose of implementing these procedures is to verify that the chemical data generated are accurate, precise, complete, comparable, and therefore, representative.

Laboratory data will be entered into a relational environmental database equivalent. The format for QC data assessment is presented below.

3.2.1 Procedures for Assessing Data

Chemical data will be assessed for accuracy, precision, and completeness for both the laboratory analytical program and field sample collection activities. The primary goal of the program is to ensure that the data generated are representative of environmental conditions at the site. To meet this goal, a combination of statistical procedures and qualitative evaluations will be used to check the quality of the data; however, the results of the statistical analyses will not be used to eliminate data from the database. Accuracy, precision, completeness, and comparability will be computed in the manner described in the following paragraphs.

The goal of the assessment will be to demonstrate that (1) a sufficient number of meaningful measurements were made to address important issues at the site, and

(2) necessary conclusions may be reached. If data are found to be less than satisfactory for the intended project uses, the data will be annotated. Sample re-collection and analysis will be used only in cases of extreme QC problems (see Corrective Actions, Section 11).

The QA/QC assessment program will evaluate data on the basis of sample type and laboratory QC samples. The schedule of laboratory QC samples is described in the specific method. The schedule of field QA/QC samples for each media is summarized in Table 3-2.

Table 3-2
Summary of Field Quality Assurance Samples

Sample Type	Field Duplicate	Field Blank	Equipment Rinseate	Laboratory MS/MSD
Soil	1 in 10	1 in 10	1 in 10	--

The procedure for collecting field QC samples is described in detail in the FSP. The general definitions of types of project QC samples are given in the following subsections.

3.2.1.1 Duplicate Samples

Duplicate samples are independent samples collected such that they are equally representative of the parameter(s) of interest at a given point in space and time. Duplicate samples, when collected, processed, and analyzed by the same organization, provide intra-laboratory precision information for the entire measurement system including sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis.

3.2.1.2 Field Blanks

Field blanks are clean, analyte-free materials closely resembling the sample matrices to be encountered in the actual samples. Containers and chemical/reagents are transported to the field and exposed to the same conditions as field samples. Caps are removed from containers, if applicable, preservatives are added and other related steps are taken to provide the blank with exposure to contamination equivalent to that of field samples.

3.2.1.3 Matrix Spike/Matrix Spike Duplicates

MS/MSDs are samples created when the laboratory injects known concentrations of target analytes into a prepared portion of a sample immediately before analysis. It provides information on matrix effects encountered during analysis; that is, suppression or enhancement of instrument signal levels. MSs are principally used for determining accuracy, but when used together with MSDs, they will yield information on analytical precision.

3.2.1.4 Equipment Rinseate Blanks

Equipment rinseate blanks are defined as samples that are obtained by running analyte-free distilled water through sample collection equipment after decontamination and placing the water in the appropriate sample containers for analysis. These samples will be used to determine if decontamination procedures have been sufficient. These procedures are included in the sampling program, as appropriate.

3.2.2 Assessing Data Accuracy and Precision

Accuracy and precision for sample data will be calculated in the RI/FS final report by evaluating data from blanks and duplicate QA/QC samples. Procedures for evaluating accuracy and precision are described below for each QA/QC sample type.

3.2.2.1 Blanks (Accuracy)

The evaluation procedure for blanks is a qualitative review of the analytical data reported by the laboratories and includes the steps listed below.

1. Tabulate the data from the blank samples.

2. Identify any blank samples exhibiting detectable concentrations of target analytes.

3. If no target analytes are detected in any blank samples, make the tables ready for entry into the appropriate report.

4. If any chemicals are found in blank samples, report the compound(s) and concentration(s) and assess the field data for that time for potential problems with data interpretation. Do not remove any data from the database on the basis of target analytes being detected in blank samples. However, make appropriate notations in the reports.

3.2.2.2 *Duplicates or Matrix Spike Duplicates (Precision)*

The procedure for assessing duplicate samples will be as follows:

Tabulate duplicate data and calculate the relative percent difference (RPD) as shown below for each duplicate pair:

$$RPD(\%) = \frac{X_1 - X_2}{X} \times 100\% \qquad (3\text{-}1)$$

where:

X_1 = concentration for sample 1 of duplicate
X_2 = concentration for sample 2 of duplicate
X = average of samples 1 and 2

3.2.2.3 *Matrix Spikes (Accuracy)*

Accuracy is the degree of conformity of a measurement (or an average of measurements of the same parameter), X, with an accepted reference or true value, T, usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100(X-T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measurement of the bias in a system. Internal laboratory QC samples (surrogate and MS) yield information on accuracy.

3.2.3 Assessing Data Completeness and Comparability

Overall completeness for the sample data collected will be calculated according to Equation 3-2:

$$C(\%) = \frac{V}{T} \times 100\% \qquad (3\text{-}2)$$

where:

C = completeness of analytical effort in percent
V = amount of valid data obtained
T = amount of valid data expected under normal conditions

Comparability is the confidence with which one data set can be compared to another. Comparability may be assessed by comparing sampling methodology, analytical methodology, and measurements of reported data.

Section 4.0

Sampling Procedures

The detailed description of sampling procedures and equipment are in the FSP. These procedures include the following:

- Selecting split sampling locations
- Collecting samples for each matrix and parameter
- Packing, handling, and shipment samples (including considerations for sample holding times)
- Preparing sample containers for special conditions and time requirements
- Preparing duplicates and field blanks
- Documenting sampling activities (Field Sampling Data Sheets, sampling conditions, and sample analyses to be conducted)
- Decontaminating equipment, if any

Reference to and use of approved EPA methodologies and protocols are indicated wherever possible. The FSP also includes descriptions of the methods to be used to provide QC checks on the field program. Information concerning sample scheduling, field documentation, sample handling, preserving and shipping, and Chain-of-Custody (COC) procedures are outlined in the FSP.

Section 5.0

Sample Custody

Sample custody procedures will be followed through sample collection, transfer, analysis, and ultimate disposal. The purposes of these procedures are to ensure that (1) sample integrity is maintained during sample collection, transportation, and storage before analysis, and (2) post-analysis sample material is properly disposed. Laboratory deliverables also are discussed in this section.

5.1 Field Custody Procedures

Samples will be handled by as few people as possible. Each sample will be properly labeled immediately after collection. CH2M HILL oversight personnel are personally responsible for custody of the collected split samples from the time they are received from JN until they are properly transferred to the laboratory or shipping company. Field custody procedures include sample labels, Field Sampling Data Sheets, COC records, custody seals, and proper sample transfer documentation. All of these procedures are detailed in the FSP, and examples of the forms are contained in Appendix A of the FSP.

5.2 Laboratory Custody Procedures

A sample custodian will be designated by the laboratory to receive sample shipments from the field. The custodian will accept custody of the samples delivered from the field to the laboratory and will verify that the information on the sample label matches the information on the COC record(s). The custodian will enter the appropriate data from the COC record into the laboratory sample-tracking system by using the sample number from the sample label, or by assigning a unique laboratory number to each sample. The

custodian will transfer the sample(s) to the proper analyst(s) or will store the sample(s) in an appropriate secure area until they are analyzed.

The laboratory sample custodian will notify CH2M HILL personnel of any discrepancies on the COC or sample labels. Samples will not be analyzed until the discrepancy is resolved. Any changes made will be documented by the laboratory and by CH2M HILL according to Subsection 5.3.

Laboratory personnel are responsible for custody of samples from the time they are received until sample analysis is complete. Any unused portions of samples remaining after they have been analyzed by the laboratory will be disposed of according to procedures developed by the laboratory that are consistent with existing laws and regulations governing sample disposal. If, for any reason, unused sample portions cannot be disposed of by the laboratory, these sample portions will be returned to the site for final disposal.

5.3 Corrections to Documentation

Original data recorded in the Field Sampling Data Sheets, COC records, and other forms will be written in waterproof ink. None of the documents will be altered, destroyed, or discarded even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on a document, the individual making the entry will make the correction by drawing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information will not be obliterated. Any additional error(s) discovered on a document will be corrected by the person who made the entry. All corrections will be initialed and dated by the author.

Section 6.0

Instrument Calibration Procedures and Frequency

A variety of instruments, equipment, and sampling tools will be used to collect data and samples and to monitor site conditions. Proper calibration, maintenance, and use of instruments and equipment is imperative for quality data to be collected. A record of calibration and maintenance activities is as important as the data record itself to verify the delivery of quality data.

The calibration procedures used for field instruments are part of the standard operating procedures (SOP) and are included in the FSP. Calibration procedures will follow those recommended by the manufacturers of the instruments. Laboratory calibration procedures are defined by EPA method protocols.

6.1 Field Instruments

Until further notice, no field instruments will be used by CH2M HILL field oversight personnel during the OU No. 2 DRA.

6.2 Laboratory Instruments

The laboratory is responsible for equipment and instrument calibration and maintenance. Manufacturer's guidance should be followed for general upkeep. The laboratory is also required to comply with calibration criteria specified in the applicable EPA test methods. All laboratories participating in the ARCS program will follow the calibration procedures and adhere to the specified frequencies that are contained in the approved analytical method used by the laboratory.

Section 7.0

Laboratory Scheduling, Quality Control Criteria, and Deliverables

Samples collected during the course of the investigation will be analyzed by laboratories in the U.S. EPA Contract Laboratory Program (CLP). Laboratory assignment and scheduling are important elements of smooth and efficient operations. Close coordination of activities began before sampling and will continue through analysis of samples. The analytical methods for the target analyte list (TAL) compounds will be performed in conformance with *EPA Test Methods for Evaluating Solid Waste, Volume 1A: Laboratory Physical & Chemical Methods.*

7.1 Laboratory Scheduling

CH2M HILL personnel will notify the EPA of scheduled sampling events. The EPA will notify the Sample Management Office (SMO), and SMO subsequently will notify the laboratory of the planned sampling schedules sufficiently in advance to allow them to schedule space and time to conduct the analyses. The sample shipments, as they occur, will be reported by the contractor to the EPA and SMO within 24 hours of the shipment. Weekly activity reports will be submitted to the EPA and SMO, as appropriate.

7.2 Laboratory Quality Control Criteria

Criteria for determining the accuracy and precision of analysis methods and laboratory preparation procedures involve method blanks, matrix spikes, and replicate analyses. The

exact procedures and frequencies for these QC methods will be in accordance with the laboratory's QA/QC procedures, which are based on EPA's guidance.

7.3 Laboratory Deliverables

The laboratory performing analyses for this project will provide one data deliverable. At a minimum, the deliverable will provide the following:

- QC summary packages
- Sample data packages
- Standards data packages
- Initial and continuing calibration raw data
- Raw QC data
- Blank data
- MS/MSD data
- Additional performance criteria specific to analytical methods
- COC or similar documentation
- Analysis logbook pages
- Instrument logbook pages
- Bench sheets
- Instrument readout records
- Computer diskettes of data in specified format
- Chromatographic charts
- Raw data summaries
- Correspondence or memoranda

Section 8.0

Data Reduction, Validation, and Reporting

Data collected will be managed, distributed, and preserved to substantiate and document that the data are of known quality and are properly maintained. Technical data, including field data and the results of laboratory sample analyses, will be tracked to monitor the performance of the sampling and analysis tasks, and to facilitate data evaluations.

8.1 Data Validation

Data validation is a systematic procedure of reviewing a body of data against a set of known criteria to verify its validity before its intended use. Data validity may vary depending on sampling procedures, sample shipment documentation, analytical methods, and data reporting. Validation procedures conducted as part of this project will include the following activities according to EPA guidance (EPA, 1988):

- Reviewing field documentation (for example, sample collection log, COC forms, and request-for-analysis documents) to match samples submitted for analysis
- Verifying COCs
- Checking laboratory data for processing and transcription errors
- Comparing data on duplicate samples for precision

- Comparing blank values to sample values to lower the validation status of samples affected by contamination, if any

- Comparing sample analysis dates to applicable holding times

- Evaluating data on matrix spikes for accuracy

- Summarizing and assigning validation levels to the sample data

- Preparing final validation and submitting it with the data package

8.2 Data Reduction

To determine the quantitative statistical significance of chemical data, the following items will be reviewed as appropriate:

1. Laboratory/field instrumentation, including calibration data, standard methods, and references

2. Proper sample bottle/container preparation

3. Laboratory analysis methods, including reference methods

4. Laboratory analysis detection limits

5. Analysis of laboratory preparation blanks at a frequency of at least 1 per 10 samples

6. Analysis of equipment rinseates at a frequency of at least 1 per 10 samples

7. Analysis of laboratory MS/MSDs at a frequency of at least 1 per 10 samples if the analyte is amenable to spiking

8. Analysis of field duplicates at a frequency of at least 1 per 10 samples for each matrix

9. Analysis of laboratory duplicates at a frequency of at least 1 per 10 samples

10. Presentation of tabulated QC data or QC charts/acceptance criteria

11. QA/QC certification of the laboratory

To evaluate the custody and document control for samples and results, the following items will be reviewed, collected, and kept in the project files:

1. Field custody noted in Field Sampling Data Sheets or transfer-of-custody documentation (COC form)

2. Samples hand-delivered to laboratory or transfer-of-custody documentation (COC form)

3. Laboratory custody documented by transfer-of-custody documentation (COC form) from field personnel

4. Laboratory custody documented through designated laboratory sample custodian with secured sample storage area

5. Sample designation number(s) traceable through entire monitoring system

6. Field Sampling Data Sheets and all custody documents stored in secure repository

7. All forms filled out completely in indelible ink with any alterations initialed

8. Identity of sampler

9. Date of sample collection, shipping, and laboratory analysis

To determine sample representativeness, the following items must be checked:

1. Compatibility between field and laboratory measurements or suitable explanation of discrepancy

2. Analysis within time limits suitable for the preservation and analysis methods

3. Sample shipment within suitable temperature conditions

4. Proper sample containers (that is, inert)

5. Proper sample collection equipment (that is, inert), properly decontaminated, not biased

6. Proper sample preservation techniques

7. Proper laboratory preparation techniques (for example, grinding, sieving, drying, digestion)

8. An evaluation to determine bias screening

9. Sample representativeness

To evaluate the physical data that support the analytical data, the following items will be reviewed:

1. Sampling date and time

2. Sampling personnel

3. Sampling location, including physical description

4. Sample collection technique

5. Field preparation techniques (for example, sample filtration)

6. Visual classification of sample using an accepted classification system (if applicable)

7. A thorough description of the methodology used and a rationale for using that methodology

8. Complete documentation of record-keeping practices

9. Field Sampling Data Sheets and all custody documents stored in a secure repository

10. All forms filled out in indelible ink with any alterations initialed

8.2.1 Reduction of Analytical Data

Accuracy is a percent recovery for a spiked sample for organic analyses. MS/MSDs are used to evaluate the data for accuracy. MS/MSDs are actual samples spiked in the laboratory with a representative group of TCL analytes. One sample of each ten samples will be split for MS/MSD analysis.

Precision is the RPD of MS recoveries for two MSs of the same sample (MS/MSD recoveries). Precision also will be assessed by comparing results for field sample duplicates to provide information on homogeneity of field sampling techniques and on laboratory sample preparation and analysis.

8.2.2 Reduction of Field Measurement Data

The validity of all data will be determined by checking calibration procedures used in the field and by comparing the data to previous measurements obtained at the specific site.

8.3 Reporting Requirements

CH2M HILL provides EPA with regular updates of progress at OU No. 2. The results of sample analyses will be presented, along with a diagram showing sampling locations, in daily and monthly oversight reports.

Section 9.0

Internal Quality Control Checks

Internal QC procedures are designed to ensure and document the overall quality of data. Two types of QC checks (field and laboratory) will be employed to evaluate the performance of the laboratory's analytical procedures. The QC checks represent the system checks and controlled samples introduced into the sample analysis stream that are used to validate the data and to calculate the accuracy and precision of the chemical analysis program.

9.1 Field Quality Control Checks

Field QC checks are accomplished by submitting controlled samples that are introduced to the laboratory from the field. Duplicate samples will be used for this investigation, and will be submitted to the laboratory as blind samples. Any samples submitted as blind samples will be noted in the Field Sampling Data Sheets and given a sample number that does not indicate to the laboratory that the sample is a QC check.

9.2 Laboratory Quality Control Checks

Laboratory QC checks are accomplished by using system checks and QA/QC samples that are introduced into the sample analysis stream.

- Initial Calibration—An analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the measurement instrumentation.

- Continuing Calibration or Check Standard—An analytical standard run every 2 hours for metals to verify the calibration of the gas chromatography/mass spectroscopy (GC/MS) system and the metals instrumentation.

- Method or Preparation Blank—An analytical control consisting of all reagents, internal standards, and surrogate standards carried through the entire analytical procedure. The method blank is used to define the level of laboratory background contamination.

- Internal Standards—Compounds added to every standard, blank, MS/MSD sample, and sample extract at a known concentration before analysis. Internal standards are used as the basis for quantitation of the target compounds.

- Surrogates—Compounds added to every blank, sample, MS/MSD, and standard; used to evaluate analytical efficiency by measuring recovery. Surrogates are brominated, fluorinated, or isotopically labeled compounds not expected to be detected in environmental media.

- Laboratory Control Sample-A reference sample with known analytes and concentrations in a matrix similar to that of the sample; used to evaluate the laboratory performance.

Section 10.0

Performance and System Audits

Performance and system audits are used to evaluate the accuracy of the total measurement system. Samples will be analyzed by one of the laboratories in the U.S. EPA Contract Laboratory Program (CLP). These laboratories have been reviewed by EPA and deemed appropriate for this project. No additional auditing is envisioned.

The CH2M HILL task leader or a designated representative will review the field activities each time samples are split. The audit for completeness will include the following items:

- Sample labels
- COC records
- Field Sampling Data Sheets
- Sampling operations
- Document control

The first three items above will be checked for completeness as defined in the FSP. Sampling operations will be reviewed to determine if they are performed as stated in the FSP, or as directed by the task leader. The informal document control audit will consist of checking each document for accountability, including such items as signatures, dates, and project numbers.

Appendix A provides the CH2M HILL internal audit checklist that will be used for QA/QC purposes.

Section 11.0

Preventive Maintenance

Samples will be collected by JN and so the necessary equipment maintenance (if any) will also be the responsibility of JN. Maintenance procedures and schedules for all field and laboratory analytical instruments will be in strict accordance with the recommendations of the equipment manufacturers. Routine maintenance will be performed by laboratory personnel as needed. All records of inspection and maintenance will be dated and documented in laboratory record books.

Section 12.0

Corrective Action Procedures

This section describes the field and laboratory corrective action program, including predetermined limits for data acceptability beyond which corrective action is required, project personnel responsible for initiating the corrective action, and individuals responsible for approving corrective action, if necessary.

12.1 Field Situations

The need for corrective action will be identified as a result of the informal field audits previously described. If problems become apparent and are identified as originating in the field, immediate corrective action will be taken and the task leader will be responsible for implementing the corrective action. If immediate corrective action does not resolve the problem, appropriate personnel will be assigned to investigate and evaluate the cause of the problem. Once a corrective action is implemented, the effectiveness of the action will be such that the end result is elimination of the problem.

12.2 Laboratory Situations

A system for corrective action is already in place based on the CLP procedures. Corrective action is the responsibility of the laboratory QA officer and may include, but is not limited to, the following:

- Reanalyzing the samples, if holding time criteria permit

- Evaluating and amending sampling and analytical procedures
- Accepting data with an acknowledged level of uncertainty
- Re-sampling and analyzing samples only if EPA/CH2M HILL determines that the data are critical to effectively assess the DRA

In the event that the above corrective actions are deemed unacceptable, an alternate laboratory will be selected to perform necessary or appropriate verification analyses.

12.3 Immediate Corrective Action

Any equipment and instrument malfunctions will require immediate corrective actions. The laboratory is responsible for immediate corrective action on its instruments and other laboratory equipment. The DHA Contractor is responsible for field sampling corrective actions. The laboratory QC charts are working tools that identify appropriate immediate corrective actions to be taken when a control limit has been exceeded. They provide the framework for uniform actions as part of normal operating procedures. The actions taken should be noted in field or laboratory logbooks, but no other formal documentation is required unless further corrective action is necessary. These on-the-spot corrective actions will be applied daily as necessary.

12.4 Long-Term Corrective Action

The need for long-term corrective action may be identified by standard QC procedures, control charts, and/or system audits. Any procedural or data quality problem that cannot be resolved by immediate corrective action falls into the long-term category.

The essential steps in a corrective action system are listed below:

- Identify and define the problem.
- Investigate and determine the cause of the problem.
- Determine and implement a corrective action to eliminate the problem.
- Verify that the corrective action has eliminated the problem.

Documentation of the problem is important in corrective action. The responsible person may be an analyst, site or laboratory QA Officer, sampler, DHA Contractor's field team leader, or CH2M HILL's observer. In general, the laboratory QA Officer will investigate the situation and determine who will be responsible for implementing the corrective action. CH2M HILL will verify that the corrective action has been taken, appears effective, and, at appropriate later dates, will verify that the problem has been resolved.

The required corrective action will be documented by CH2M HILL. The corrective action will be discussed with EPA's RPM before it is implemented if the severity of the problem warrants such discussion.

Section 13.0

Quality Assurance Reports

A QA Summary will be completed at the end of the field activity to summarize the QA/QC status of the sample splitting, and any problems. It will be an assessment of the measured QA parameters; for example, precision, accuracy, and results of performance audits; any reported non-conformance; and any significant QA problems and the recommended solutions. This assessment will be included as part of a regular monthly oversight report.

Any change in the QAPP will be summarized in a report or letter and sent to the RPM.

Section 14.0

Document Control

Project files are incorporated in the document control system developed for the ARCS program. The system contains accurate working files on all work documentation, including calculations, assumptions, interpretations of regulations, sources of information, and other raw data. The program is flexible enough to allow inclusion of currently unforeseen types of documents. The object of the document control system is accountability of all project documents at project completion.

Section 15.0

List of References

Camp Dresser & McKee. *Field Sampling Plan for Dallas Housing Authority, OU 02.* January 1994.

Camp Dresser & McKee. *Demolition and Removal Action Work Plan for Dallas Housing Authority, OU 02.* January 1994.

United States Environmental Protection Agency. *ARCS Generic Quality Assurance Project Plan.* May 1989.

United States Environmental Protection Agency. *Data Quality Objectives for Remedial Response Activities.* OSWER Directive 9355.0-7B.

United States Environmental Protection Agency. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* EPA/540/G-89/004. October 1988.

United States Environmental Protection Agency. *Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analysis.* February and July 1988.

United States Environmental Protection Agency. *Sampler's Guide to the Contract Laboratory Program.* Office of Emergency and Remedial Response. Washington, D.C. 1990.

United States Environmental Protection Agency. *Test Methods for Evaluating Solid Waste, Volume 1A: Laboratory Physical and Chemical Methods.* 1989

United States Environmental Protection Agency. *User's Guide to the Contract Laboratory Program.* Office of Emergency and Remedial Response. Washington, D.C. December 1988.

Appendix A

CH2M HILL Internal Audit Checklist

Complete form on a weekly basis. Use N/A for items that do not apply. Do not leave blanks.	
Sample Labels	
Item	**Comment**
Sample Identification Number	
Sample location and depth (if applicable)	
Date/Time	
Analysis	
Preservative	
Chain-of-Custody Records	
Item	**Comment**
Location identification, date, time, and sample number correspond to sample label	
Proper identification of parameters to be analyzed	
All custody transfers documented, and date, time, and signatures recorded	
Proper storage and security for samples (for instance, custody seals on coolers)	

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Complete form on a weekly basis. Use N/A for items that do not apply. Do not leave blanks.	
Field Sampling Data Sheets	
Item	**Comment**
Indelible ink on waterproof paper	
All entries signed and dated	
Field equipment calibration recorded	
Field measurements recorded	
Detailed field activity descriptions recorded	
Proper documentation of photographs (name of photographer, date, time, site location and description, direction photograph faces), if taken.	

Complete form on a weekly basis. Use N/A for items that do not apply. Do not leave blanks.	
Sampling Operations	
Item	**Comment**
Sampling procedures conform with FSP specifications.	
Decontamination procedures conform with FSP specifications.	
Sampling, handling, and shipping procedures conform with FSP specifications.	
Chain-of-Custody completed and shipped properly.	
Field QA/QC samples taken as specified in QAPP.	
Field activities in conformance with the Safety Awareness Plan.	

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Complete form on a weekly basis. Use N/A for items that do not apply. Do not leave blanks.	
Document Control	
Item	**Comment**
All field sampling forms and logbooks are complete with such items as signatures, dates, and project name	
All sampling forms and logbooks are properly filed or stored	

Name: _____

Block Letters

_____

Signature

Date: _____

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